

ANNUAL REPORT FOR 2005



Indian Creek Mitigation Site

Lincoln County

Project No. 8.1811002

TIP No. R-0617BA



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TABLE OF CONTENTS

SUMMARY	1
1.0 INTRODUCTION	2
1.1 Project Description.....	2
1.2 Purpose	2
1.3 Project History	4
2.0 HYDROLOGY.....	4
2.1 Success Criteria	4
2.2 Hydrologic Description	4
2.3 Results of Hydrologic Monitoring.....	6
2.3.1 Site Data	6
2.3.2 Climatic Data	8
2.4 Conclusions.....	8
3.0 VEGETATION.....	10
3.1 Success Criteria	10
3.2 Description of Species	10
3.3 Results of Vegetation Monitoring.....	11
3.4 Conclusions.....	11
4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS	11

FIGURES

Figure 1. Site Location Map.....	3
Figure 2. Monitoring Gauge Location Map.....	5
Figure 3. 2005 Hydrologic Monitoring Results.	7
Figure 4. 30-70 Percentile Graph.....	9

TABLES

Table 1. 2005 Hydrologic Monitoring Results.....	6
Table 2. Vegetation Monitoring Statistics.....	11

APPENDICES

APPENDIX A - GAUGE DATA GRAPHS
APPENDIX B - SITE PHOTOGRAPHS

SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Indian Creek Mitigation Site. Site construction began in February 2005 and was completed within the same month. Monitoring activities in 2005 represent the first year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success for a minimum of five years or until the site is deemed successful.

The site is monitored with four groundwater gauges, one rain gauge and one vegetation plot.

The daily rainfall data depicted on the monitoring gauge graphs was recorded from an onsite rain gauge. An offsite rain gauge, maintained by the NC State Climate Office in Lincolnton, contributed to the daily rainfall data and historical rainfall data used for the 30th –70th percentile analysis.

The 2005-year represents the first year for hydrology monitoring. Two of the four-groundwater gauges exceeded the success criteria of saturation within 12" of the soil surface for greater than 10% of the growing season. The two gauges that did not meet are located in the wetland creation area.

The 2005 vegetation monitoring of the site revealed an average density of 453 trees per acre, which is above the minimum success criteria of 320 trees per acre.

NCDOT will continue to monitor the Indian Creek Mitigation Site for hydrology and vegetation.

1.0 INTRODUCTION

1.1 Project Description

The Indian Creek Mitigation Site is located on Pleasant Union Church Road, south of Lincolnton and just north from the town of Crouse. The site is adjacent to Indian Creek in Lincoln County (Figure 1). NCDOT is using onsite mitigation at the Indian Creek Site to offset impacts to existing wetlands and streams from construction of NC 150 in Lincoln County.

The Indian Creek Site consists of approximately 20.0 acres of wetland creation, enhancement, and preservation; stream enhancement (with riparian buffer restoration and enhancement), and uplands enhancement and preservation.

Headwater wetlands were created through minor grading of deforested uplands (0.6-acre). Wetland enhancement consisted of planting approximately 0.9-acre of existing emergent wetland and the preservation area included approximately 6.2 acres of headwater and scrub-shrub wetlands. Stream enhancement was performed on approximately 1,280 feet of channel and included 480 feet of buffer restoration and 800 feet of buffer preservation (3.0 acres total). Uplands (6.4 acres) were enhanced through planting and preserved (4.4 acres) on the Indian Creek Mitigation Site.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria for hydrology and vegetation are based on the approved mitigation plan dated August 2002. The following report details the results of hydrologic and vegetative monitoring activities that were performed during the 2005-growing season at the Indian Creek Mitigation Site.

Figure 1. Site Location Map



1.3 Project History

February 2005	Site Planted
March-November 2005	Hydrology Monitoring (1 st year)
July 2005	Vegetation Monitoring (1 st year)

2.0 HYDROLOGY

2.1 Success Criteria

Per the mitigation plan dated August 2002, groundwater hydrology on the Indian Creek Mitigation Site shall be monitored for five years following the completion of all implementation activities, or until hydrologic success criteria are met. As stated in the approved mitigation plan, hydrologic success is defined as inundated or saturated soil conditions within a major portion of the root zone (within 12 inches of the soil surface) for greater than or equal to 10% of the growing season in most years.

The growing season in Lincoln County begins March 28 and ends November 4. These dates correspond to a 50% probability that temperatures will drop to 24°F or lower after March 28 and before November 4.¹ The growing season is 222 days; therefore, optimum hydrology requires 10% of this season, or at least 22 consecutive days. Local climate must also represent average/normal conditions for the area.

2.2 Hydrologic Description

In March 2005, four groundwater gauges were installed across the site (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. The 2005-year represents the first growing season that the monitoring gauges have been in place since construction of the site.

The Indian Creek Site was designed to restore the groundwater hydrology on the site.

¹ Soil Conservation Service, Soil Survey of Lincoln County, North Carolina.

Figure 2. Monitoring Gauge Location Map

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 222-day growing season. The results are presented in Table 1. Figure 3 also provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 10% of the growing season. Gauges highlighted in red show hydrology between 5% and 10% of the growing season. Those gauges highlighted in black indicate no wetland hydrology (< 5% of the growing season).

Appendix A contains a plot of the groundwater depth for each monitoring gauge. The maximum number of consecutive days is noted on each graph. An onsite rain gauge was used to obtain rainfall data from the site. It has been compared with rainfall data obtained from the State Climate Office Local Weather Station in Lincolnton.

Table 1. 2005 Hydrologic Monitoring Results

Monitoring Gauge	<5%	5%-10%	>10.0%	Actual %	Success Dates
GW-1	X			3.6	
GW-2	X			3.6	
GW-3*			X	19.8	March 28-May 10 July 27-Sept 3 Oct 7-Nov 4
GW-4*			X	18.9	March 28-May 8 June 20-July 25

*Gauge met success during an average rainfall month (May).

Specific Gauge Problems:

- Gauges (GW-1) and (GW-3) were replaced after being vandalized/pulled from the site (Missing Data: May 11 - July 26).
- Gauge (GW- 2) stopped recording data (June 15-July 26). The gauge was replaced.

Figure 3. 2005 Hydrologic Monitoring Results

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2004 through November 2005 to historical precipitation (collected between 1974 and 2005) for Lincolnton, North Carolina. This comparison gives an indication of how 2005 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

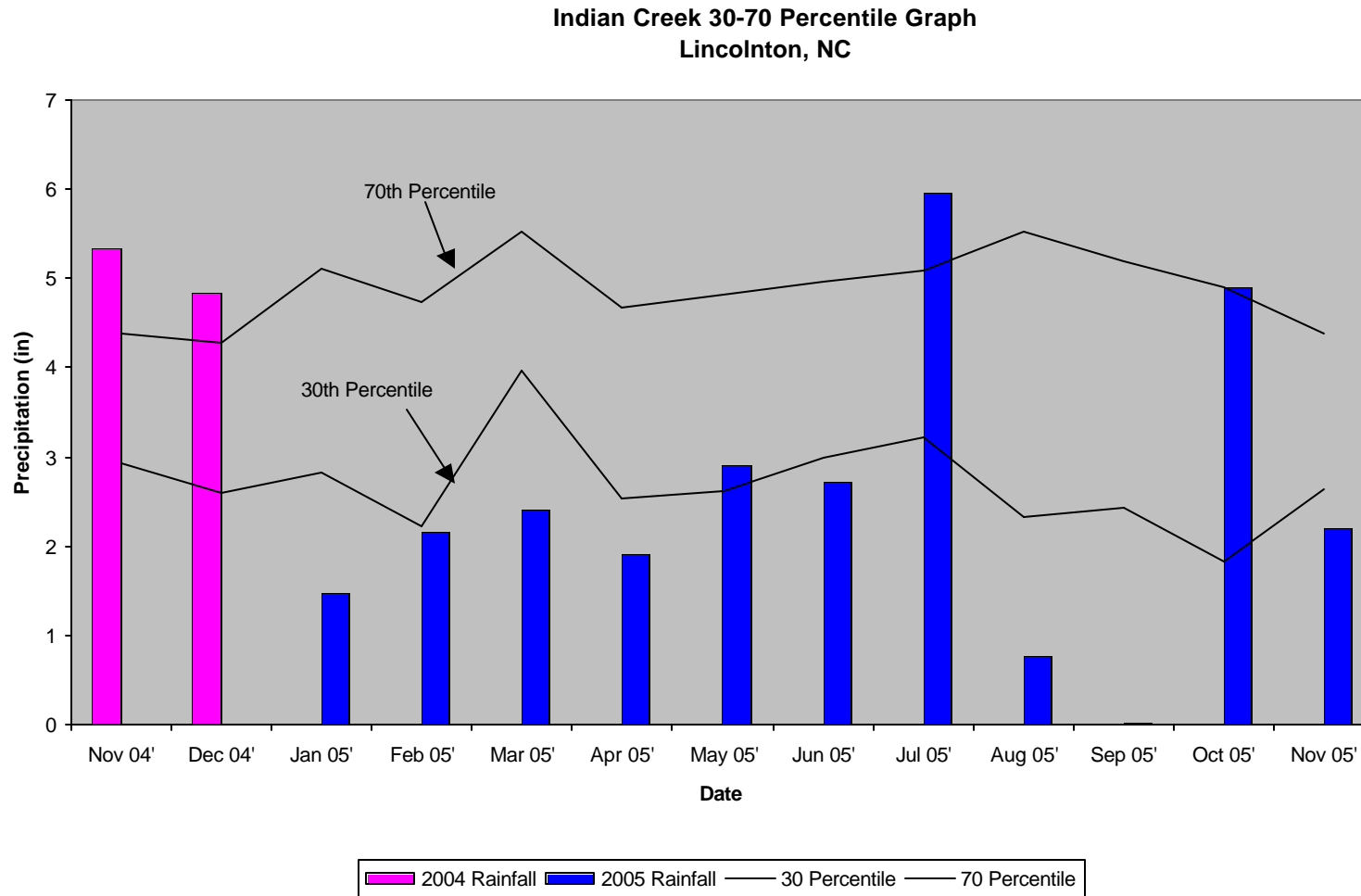
For the 2005-year, November ('04), December ('04), July, and October experienced above average rainfall. The months of January, February, March, April, June, August, September, and November recorded below average rainfall for the site, while May recorded average rainfall. Overall, 2005 experienced a below average rainfall year.

2.4 Conclusions

The 2005-year represents the first year for hydrology monitoring. Two of the four-groundwater gauges exceeded the success criteria of saturation within 12" of the soil surface for greater than 10% of the growing season. The two gauges that did not meet are located in the wetland creation area.

NCDOT will continue to monitor the hydrology at the Indian Creek Mitigation Site.

Figure 4: 30-70 Percentile Graph



3.0 VEGETATION: INDIAN CREEK MITIGATION SITE (YEAR 1 MONITORING)

3.1 Success Criteria

Success criteria have been established to verify that wetland creation areas support vegetation necessary for a jurisdictional determination. Additional success criteria are dependent upon the density and growth of characteristic forest species. For the forested wetlands, a minimum count of 320 trees per acre must be achieved within three years of initial planting and a minimum count of 260 trees per acre must be achieved within five years of initial planting.

3.2 Description of Species

The following tree species were planted in the Buffer, Creation, and Enhancement Areas:

Betula nigra, River Birch
Fraxinus pennsylvanica, Green Ash
Quercus nigra, Water Oak
Quercus phellos, Willow Oak
Platanus occidentalis, Sycamore
Quercus alba, White Oak

The following tree species were planted in the Upland Area:

Quercus alba, White Oak
Quercus phellos, Willow Oak
Liriodendron tulipifera, Tulip Poplar
Juglans nigra, Black Walnut
Prunus serotina, Black Cherry

3.3 Results of Vegetation Monitoring

Table 2. Vegetation Monitoring Statistics

Plot #	River Birch	Green Ash	Water Oak	Willow Oak	Sycamore	White Oak	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1	10		7	12	5	4	38	57	453
Average Density Trees/Acre									453

Site Notes: Other vegetation noted: goldenrod, box elder, fennel, tear thumb, poison ivy, blackberry, sweetgum, red maple, and various grasses. Green ash was noted in the creation area, even though none were counted in the plot.

3.4 Conclusions

There was one vegetation-monitoring plot established throughout the 0.9-acre of enhancement and 0.6-acre of creation. The 2005 vegetation monitoring of the site revealed an average tree density of 453 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

Two of the four groundwater-monitoring gauges met the hydrology success criteria on the Indian Creek Mitigation Site in 2005. The two gauges that are located in the wetland creation area recorded hydrology for less than 5% (consecutive) of the growing season.

The site demonstrated an average density of 453 trees per acre, which is above the minimum success criteria of 320 trees per acre.

NCDOT will continue to monitor the Indian Creek Mitigation site for hydrology and vegetation.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B
SITE PHOTOGRAPHS
PHOTO LOCATIONS & MONITORING PLOTS

Indian Creek



Photo 1



Photo 2



Photo 3





Photo 4



Photo 5

INDIAN CREEK MITIGATION SITE

		PROJECT REFERENCE NO.	SHEET NO.
		P-05176	EC-01A/0001/01
COUNTY, NEV. R/W KEY		S/W SHEET NO.	PROJECTS BUSINESS



SUPERCREATION/ENHANCEMENT REFORMATION
SEE NP-3 AND PROJECT SPECIAL PROVISIONS



UPLAND REFORMATION
SEE NP-3 AND PROJECT SPECIAL PROVISIONS

RIPARIAN BUFFER RESTORATION

UPLAND BUFFER ENHANCEMENT

UPLAND BUFFER ENHANCEMENT

WETLAND ENHANCEMENT

WETLAND CREATION

UPLAND BUFFER ENHANCEMENT



Plot Location



Photo Locations